May 6, 2020

InSite Wireless Group LLC
301 North Fairfax Street No. 101
Alexandria, Virginia 14608

Attn: Mr. Robert Mitchell
P: (617) 877 3691
E: rmitchell@insitewireless.com

Re: **Supplemental Engineering Services – Stabilized Slope Recommendations**
NY170 Nelsonville Tower
15 Rock Ledge Road
Nelsonville, New York
Terracon Project No. J5205102

Dear Mr. Mitchell:

At your request, Terracon Consultants, Inc. (Terracon) is submitting this supplemental report for NY170 Nelsonville Tower project located in Nelsonville, New York. Our engineering services have been undertaken in general accordance with the Task Order to the original Master Services Agreement reference number P65205090 dated 07/11/2013. The purpose of our supplemental engineering services is to provide global stability analyses of the proposed slope areas and provide supplemental engineering recommendations, as required, for the project. This supplemental report provides the recommendations and analyses for the proposed slope areas on the project.

## GENERAL INFORMATION

**Proposed Geometry of Slope Areas:** Based on the Site Grading, Utilities, and Erosion and Sediment Control Plan by JMC Planning, Engineering, Landscape Architecture and Land Surveying, PLLC (JMC), Drawing No. CD-5, dated March 13, 2020, there are three proposed slopes at the project site. Slope Area 1 is proposed as a fill slope with a maximum height of approximately 6.75 feet and a maximum slope angle of approximately 1.75 Horizontal to 1.0 Vertical (1.75H:1V). Slope Areas 2 and 3 are proposed as cut slopes with heights ranging from 2.0 to 8.0 feet with a maximum slope angle of approximately 1H:1V.

**Geotechnical Engineering Data:** Based on the bore hole information from the geotechnical engineering report, the geotechnical strength parameters used to model the subsurface stratigraphy for the stability analyses are summarized in the following tables.

| Soil | Unit Weight (pcf) | Internal Angle of Friction (degrees) | Cohesion (psf) |
|---|---|---|---|
| Reinforced Backfill | 120 | 30 | 0 |
| Retained Fill | 120 | 30 | 0 |
| Sandy Silt | 120 | 30 | 0 |
| Weathered Gneiss | 120 | 40 | 500 |

Boreholes located near the proposed reinforced slopes did not indicate any groundwater to the maximum depth of exploration. Therefore, no ground water was considered in the global stability analysis.

## RECOMMENDATIONS

**Slope Area 1 (Fill Slope):** Based on the Grading Plan by JMC, Slope Area 1 is a fill slope with a maximum height of approximately 6.75 feet. Considering this slope is slightly steeper than a 2H:1V slope configuration, we recommend that the fill slope should be reinforced with geogrid reinforcements. For this case, we recommend the use of primary geogrid reinforcement to stabilize the entirety of the slope as well as secondary geogrid reinforcement to provide stabilization at the face of the proposed slope.

For determination of minimum geogrid embedment lengths, Slope Area 1 was analyzed using the computer program SlopeW developed by GeoSlope. SlopeW utilizes algorithms for the Morgenstern-Price method of slices for postulated slip surfaces. The Morgenstern-Price analysis was performed on each cross section. The Morgenstern-Price method uses force and moment limit-equilibrium to determine a factor of safety against instability. This analysis is based on limit-equilibrium where the forces and moments resisting failure are compared against the forces and moments tending to cause failure. This ratio, termed the factor of safety (FOS), is an indication of stability of each postulated failure surface. Reasonable FS design values are dependent upon the confidence in the parameters utilized in the analyses performed, among other factors related to the project itself. The typically accepted minimum FOS for long-term slope stability supporting improvements is 1.5 for static analysis and 1.125 for seismic analysis.

Based on the analyses, the calculated factor of safety (FOS) against global instability for the critical surface was 1.56 for static and 1.29 for seismic conditions. Graphical results of the global stability analyses are included on Exhibits 3 and 4.

With the inclusion of primary and secondary geogrid reinforcement within the stabilized slope system, we also recommend the use of a turf reinforcement mat (TRM) for an erosion control measurement. See Exhibit 2 for a typical cross section of the proposed reinforced soil slope system.

**Slope Areas 2 and 3 (Cut Slopes):** Based on the Grading Plan by JMC, Slope Areas 2 and 3 are cut slopes with maximum heights of approximately 2.0 feet and 8.0 feet, respectively. From our understanding, these proposed slopes are likely located within a rock outcrop area. If Slope Areas 2

and 3 are within a rock outcrop area, these slopes may be cut to meet the proposed slope geometry as shown in the Grading Plan by JMC without additional reinforcement measures. The grading contractor should verify if the extent of the proposed cut slopes is entirely within the rock outcrop area prior to construction.

If the grading contractor determines the locations of Slope Areas 2 or 3 are not within a rock outcrop area and the excavation cut will consist of excavating on-site soils, we recommend that the final excavation face include a wire mesh facing, such as a Tecco® Mesh system, with anchors that are drilled into the final excavation face and attached to the wire mesh facing. In this case, Terracon should be contacted and afforded the opportunity to design the cut slope reinforcement system.

**Additional Consultation:** We are available to discuss the results of our engineering analyses, designs of these slopes and the details of this report with you. Please call should further consultation be required.

Sincerely,
**Terracon Consultants, Inc.**

Matthew W. Farrar, E.I.T.
Staff Engineer

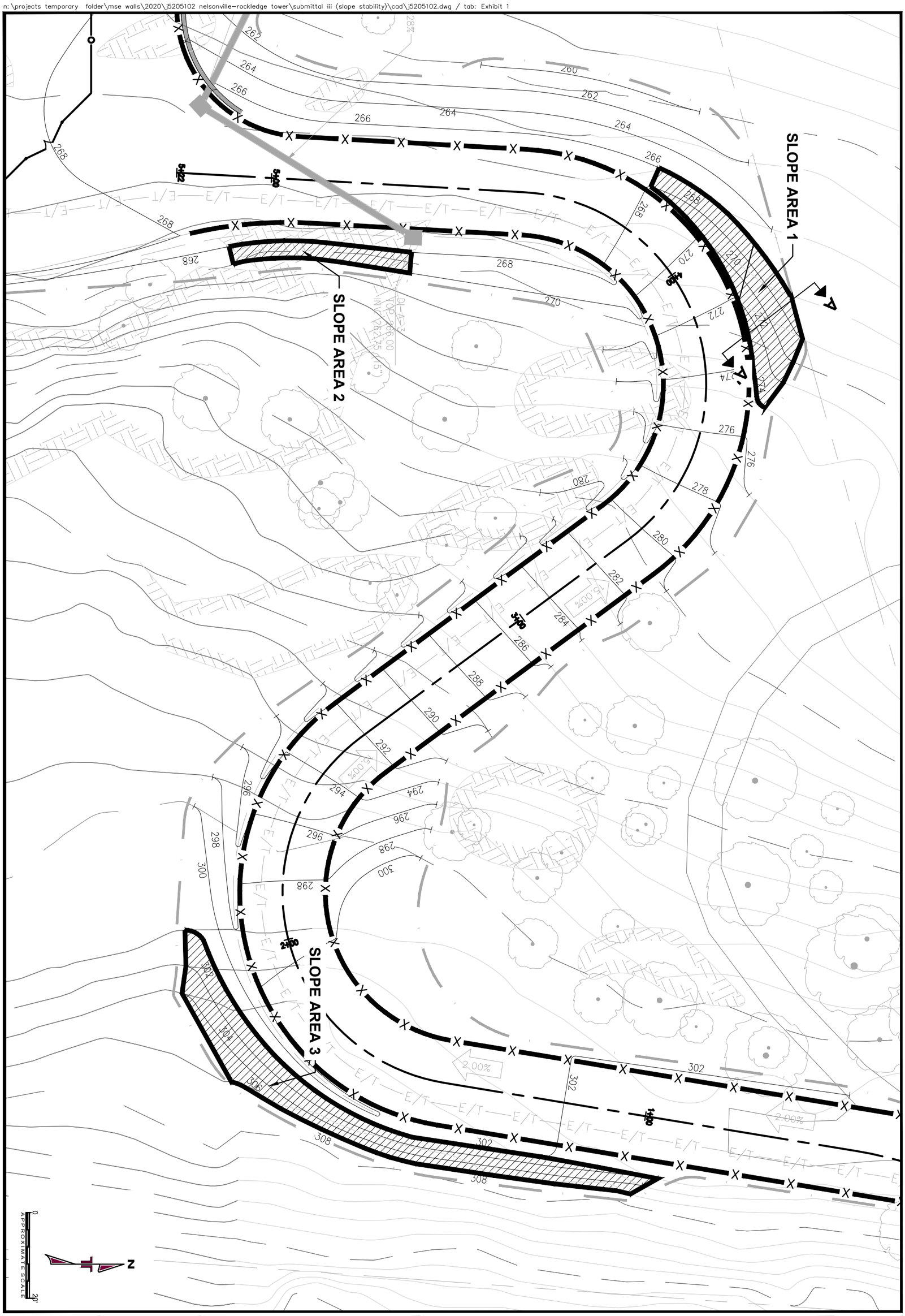
Donald R. Clark, P.E.
Senior Principal/Senior Consultant

Michele A. Fiorillo, P.E.
Geotechnical Department Manager

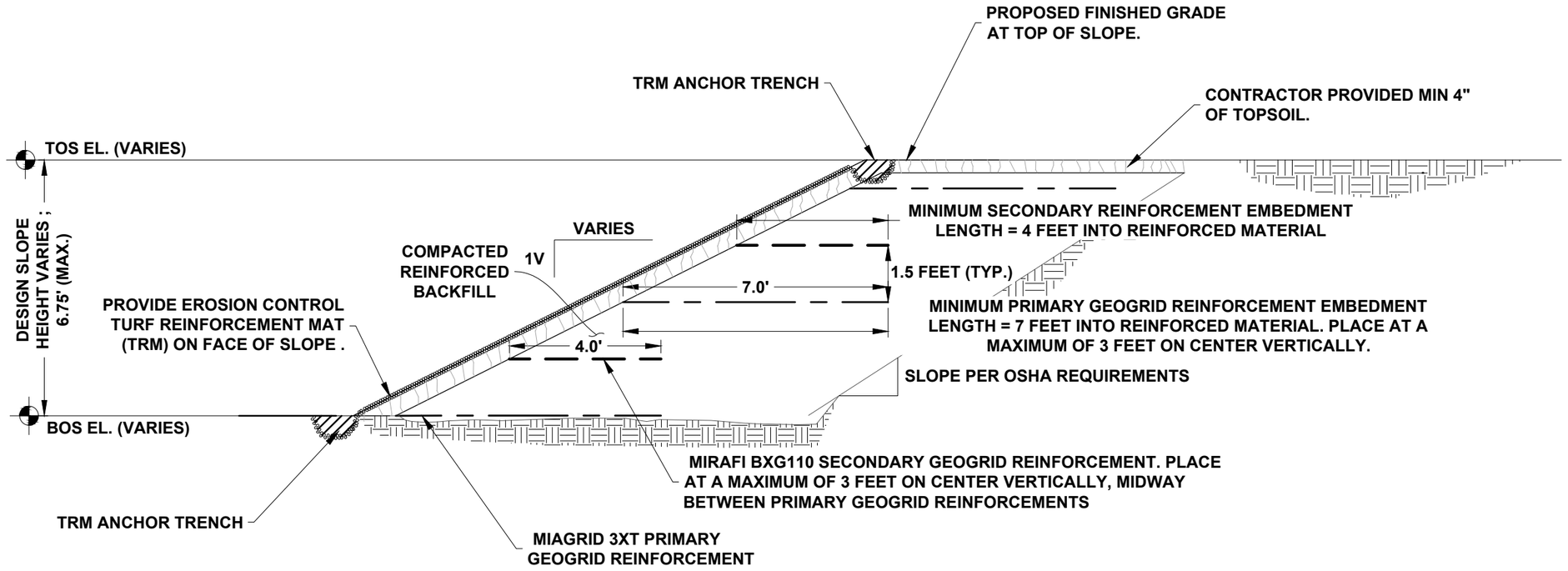

Copies to: Addressee (one electronic copy)

Attachments: Exhibits 1-4

n:\projects temporary folder\mse walls\2020\j5205102 nelsonville-rockledge tower\submittal iii (slope stability)\cad\j5205102.dwg / tab: Exhibit 1




| | | | |
|---|---|---|---|
| Project Mngr: MAF | Project No.: J5205102 | Terracon Consulting Engineers and Scientists | SITE PLAN |
| Drawn By: PPS | Scale: as shown | 4685 South Ash Avenue, Suite H-4 Tempe, AZ 85282 | NY170 NELSONVILLE TOWER |
| Checked By: DRC | File No.: J5205102 | PH. (480) 897-8200 FAX. (480) 897-1133 | 15 ROCKLEDGE ROAD NELSONVILLE, NEWYORK |
| Approved By: DRC | Date: 05/04/2020 | | EXHIBIT 1 |




**A-A'** **REINFORCED SOIL SLOPE CROSS SECTION (N.T.S)**

EXHIBIT 2

TYPICAL CROSS SECTION - SLOPE AREA 1

NY170 NELSONVILLE TOWER
15 ROCKLEDGE ROAD
NELSONVILLE, NEW YORK

Terracon
Consulting Engineers and Scientists
4685 South Ash Avenue, Suite H-4 Tempe, AZ 85282
PH. (480) 897-8200 FAX: (480) 897-1133

| | |
|---|---|
| Project No: | 5205102_RECOVER |
| Scale: | as shown |
| File No: | 5205102_RECOVER |
| Date: | 05/04/2020 |

| | |
|---|---|
| Project Mngr: | MAF |
| Drawn By: | PPS |
| Checked By: | DRC |
| Approved By: | DRC |

**NY170 Nelsonville Tower**
**Terracon Project No. J5205102**
**Slope Area 1 - Maximum Section**

Primary Geogrid Type: Miragrid 3XT
Primary Geogrid Lengths: 7 feet

Secondary Geogrid Type: Mirafi BXG110
Secondary Geogrid Lengths: 4 feet

Surcharge = 250 psf

Static Analysis

F.S. = 1.56

| Color | Name | Unit Weight (pcf) | Cohesion' (psf) | Phi' (°) |
|---|---|---|---|---|
| | Reinforced Backfill | 120 | 0 | 32 |
| | Retained New Fill | 120 | 0 | 32 |
| | Sandy Silt | 120 | 0 | 32 |
| | Weathered Gneiss | 120 | 500 | 40 |

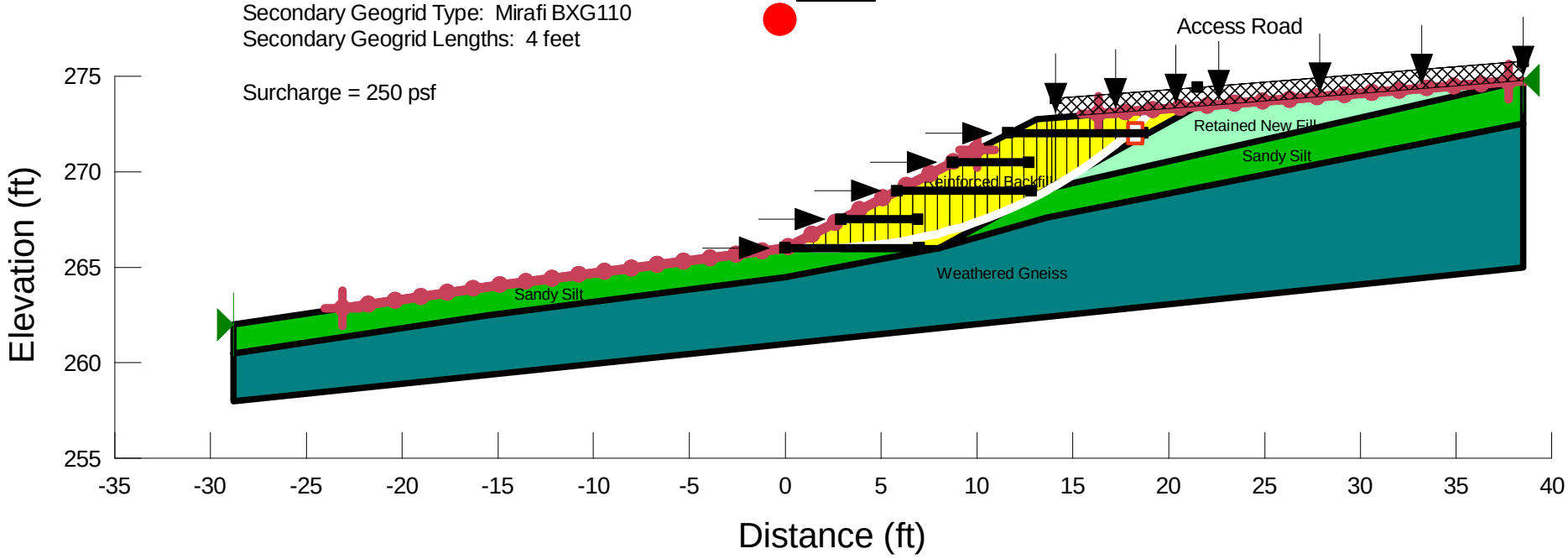



Exhibit 3

**NY170 Nelsonville Tower**
**Terracon Project No. J5205102**
**Slope Area 1 - Maximum Section**

Primary Geogrid Type: Miragrid 3XT
Primary Geogrid Lengths: 7 feet

Secondary Geogrid Type: Mirafi BXG110
Secondary Geogrid Lengths: 4 feet

Surcharge = 250 psf

A = 0.151g
Kh = 0.098

Seismic Analysis

F.S. = 1.29

| Color | Name | Unit Weight (pcf) | Cohesion' (psf) | Phi' (°) |
|---|---|---|---|---|
| | Reinforced Backfill | 120 | 0 | 32 |
| | Retained New Fill | 120 | 0 | 32 |
| | Sandy Silt | 120 | 0 | 32 |
| | Weathered Gneiss | 120 | 500 | 40 |

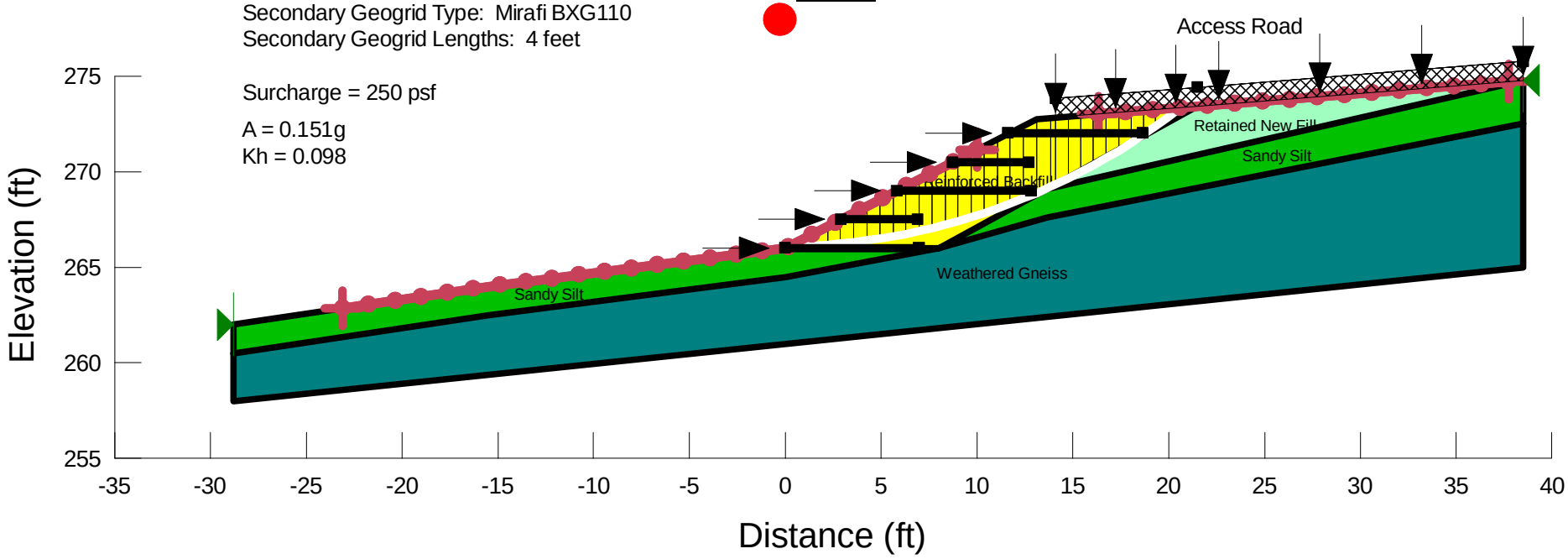



Exhibit 4